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ORIGINAL CONTRIBUTION

The effects of psychological treatment of maternal depression on children and parental functioning: a meta-analysis

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Abstract Successful treatment of parental depression may have a positive effect on the functioning and psychopathology of their children. We conducted a meta-analysis to examine the effects of psychotherapy for depressed mothers on their children and parental functioning. We used a database of randomized controlled trials examining the effects of psychotherapy for adult depression and selected trials comparing psychotherapy and control conditions in depressed mothers and reporting outcomes in their children and parental functioning. Nine studies were included. The quality of these studies was not optimal and the outcome instruments differed considerably from each other. The therapies resulted in significantly decreased levels of depression ($g = 0.66$) in the mothers. In the seven studies that reported outcomes on the mental health of children, a significant effect size was also found ($g = 0.40$). The eight studies examining mother–child interactions resulted in a significant effect size of $g = 0.35$, and the five studies examining parenting/marital distress had a pooled effect size of $g = 0.67$. We found that psychotherapy leads to decreased levels of depression in depressed mothers and also found indications that psychotherapy may have a positive effect on the mental health of their children and parenting/marital distress. However, more high-quality research is needed before a definite answer can be given.

Keywords Depression · Parental depression · Psychotherapy · Psychological treatment · Meta-analysis

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Introduction

It is well established that maternal depression is associated with increased levels of internalizing and externalizing psychopathology in their children [4] and with difficulties in family relationships and parental functioning [18, 31]. Apart from the genetic risk in children of depressed mothers, the increased risk of psychopathology in these children may be related to the negative impact of maternal depression on parenting and the family environment [20]. Fortunately, depression in adults can be treated successfully [10]. Therefore, a logical next question is whether or not the successful treatment of parental depression positively affects the functioning and psychopathology of their children.

A small, but growing literature has been examining the relation between improvements in parents' depression and change in their children's psychopathology and functioning [21]. Whereas some studies have shown that decreases in

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parents' depression were associated with better child functioning [17, 43], other studies have not found a significant relation between depressed parents' treatment or remission and their children's adaptation [30, 42]. Recent analyses of the STAR*D trial showed that remission of maternal depression was associated with decreased psychiatric symptoms and improved functioning in their children [16, 36]. Importantly, however, there was no untreated control group to adjust for natural recovery or possible third variable explanations, so no conclusions about the causal role of remission of maternal depression on improvements in child outcomes can be made from these studies.

To properly address the question of whether or not treating maternal depression to remission affects their children's adjustment, randomized controlled trials comparing treated versus untreated maternal depression are needed. Thus far, results of the relatively few controlled investigations in this field have been mixed, with some studies finding that reduction of maternal depression through treatment positively affected their children [33, 41], whereas other studies have not found such effects [6, 42].

No systematic review of randomized trials has yet examined the effects of psychological treatments of depression in mothers and the effects on their children. There is one earlier meta-analysis examining the effects of preventive interventions in mentally ill parents on the mental health of their offspring [40]. This meta-analysis is, however, includes interventions that are specifically aimed at preventing mental health problems in children, and not at the outcomes of treatment of a mental disorder in parents, although there may be some overlap. The results of this meta-analysis do point to positive effects of intervening in parents on mental health outcomes in children.

Therefore, we decided to conduct a review and meta-analysis of the literature, specifically examining the effects of psychological treatment of depressed mothers on the mental health of their children.

Methods

Identification and selection of studies

This meta-analysis was conducted according to the PRISMA guidelines. For the identification and selection of studies, we used a database of papers on the psychological treatment of depression that has been described in detail elsewhere [12] and used in a series of earlier published meta-analyses (www.evidencebasedpsychotherapies.org). This database has been continuously updated through comprehensive literature searches (from 1966 to January 2013). In these searches, we examined 14,164 abstracts from Pubmed (3,638 abstracts), PsycInfo (2,824), Embase (4,682) and the Cochrane Central Register of Controlled Trials (3,020). These abstracts were identified by combining terms indicative of psychological treatment and depression (both MeSH terms and text words). For this database, we also checked the primary studies from 42 meta-analyses of psychological treatment for depression to ensure that no published studies were missed (www.evidencebasedpsychotherapies.org). From the 14,164 abstracts (10,474 after removal of duplicates), we retrieved 1,476 full-text papers for possible inclusion in the database.

We included (a) randomized controlled trials in which (b) a psychological intervention (c) was compared to a control condition (waiting list; care-as-usual; placebo; other) (d) in depressed mothers or pregnant women and (d) outcomes were reported on the mental health of their children, the quality of the interaction between mother and child, and/or parenting/marital distress. Depression could be defined as a major depressive disorder according to a diagnostic interview, or as scoring above a cutoff on a self-report instrument, such as the CES-D (Center for Epidemiological Studies Depression scale) [38] or the EPDS (Edinburgh Postnatal Depression Scale) [9].

We excluded studies of mothers who were inpatients or adolescents ($\leq$18 years). Comorbid general medical or psychiatric disorders were not used as an exclusion criterion. No language restrictions were applied.

Quality assessment and data extraction

We assessed the validity of included studies using four criteria of the 'Risk of bias' assessment tool developed by the Cochrane Collaboration [24]. This tool assesses possible sources of bias in randomized trials, including the adequate generation of allocation sequence, the concealment of allocation to conditions, the prevention of knowledge of the allocated intervention (masking of assessors), and dealing with incomplete outcome data, which was assessed as positive when intention-to-treat analyses (i.e., all randomized patients were included in the analyses) were conducted.

We also coded additional aspects of the studies, including participant characteristics (recruitment method: community, clinical samples, or other; definition of depression: diagnosed depressive disorder or scoring above a cutoff on a self-rating depression scale; children's age), intervention characteristics (format: individual, group, or guided self-help; number of sessions; and type of psychotherapy); and study characteristics (type of control group: care-as-usual or other).

Meta-analyses

For each comparison between a psychotherapy condition and a control group, the effect size indicating the difference

between the two groups at post-test was calculated (Hedges' *g*). Effect sizes were calculated by subtracting (at post-test) the average score of the psychotherapy group from the average score of the control group and dividing the result by the pooled standard deviation. Because several studies had relatively small sample sizes, we corrected the effect size for small sample bias according to the procedures suggested by Hedges and Olkin [23].

For each comparison, we calculated a different effect size. First, we calculated effect sizes indicating the mental health of children, the mother–child relationship, and parenting/marital distress. Second, we calculated the effect sizes indicating parental functioning and distress. Finally, we calculated the effect sizes indicating the effects of the treatments on maternal depression. In these calculations, we used only those instruments that explicitly measured symptoms of depression, such as the Beck Depression Inventory [2], the Hamilton Rating Scale for Depression (HAM-D) [22], or the EPDS (Edinburgh Postnatal Depression Scale) [9]. If more than one depression measure was used, the mean of the effect sizes was calculated, so that each comparison yielded only one effect. If dichotomous outcomes were reported without means and standard deviations, we used the procedures of the Comprehensive Meta-Analysis software (version 2.2.021) (see below) to calculate the standardized mean difference.

To calculate pooled mean effect sizes, we used the computer program Comprehensive Meta-Analysis. Because we expected considerable heterogeneity among the studies, we employed a random effects pooling model.

Because the standardized mean difference (Hedges' *g*) is not easy to interpret from a clinical perspective, we transformed these values into the number-needed-to-treat (NNT), using the formulae provided by Kraemer and Kupfer [28]. The NNT indicates the number of patients that have to be treated to generate one additional positive outcome [29].

As a test of homogeneity of effect sizes, we calculated the I^2 statistic as an indicator of heterogeneity in percentages. A value of 0 % indicates no observed heterogeneity, and larger values indicate increasing heterogeneity, with 25 % as low, 50 % moderate, and 75 % high heterogeneity. We calculated 95 % confidence intervals (CI) around I^2 [25], using the non-central Chi squared-based approach within the heterogi module for Stata [35].

Subgroup analyses were conducted according to the mixed effects model [3], in which studies within subgroups are pooled with the random effects model, while tests for significant differences between subgroups are conducted with the fixed effects model. For continuous variables, we used meta-regression analyses to test whether there was a significant relation between the continuous variable and effect size.

Publication bias was tested by inspecting the funnel plot on primary outcome measures and by Duval and Tweedie's trim and fill procedure [13], which yields an estimate of the effect size after the publication bias has been taken into account (as implemented in Comprehensive Meta-analysis, version 2.2.021). We also conducted Egger's test of the intercept to quantify the bias captured by the funnel plot and tested whether it was significant.

Results

Selection and inclusion of studies

Figure 1 presents a flowchart describing the inclusion process. Nine studies met inclusion criteria and therefore were in this meta-analysis [5, 6, 32–34, 37, 39, 41, 42]. Selected characteristics of the included studies are presented in Table 1. The measures used in the studies to examine the outcomes on children's mental health, the mother–child interactions, and parenting/marital distress are reported in Table 2.

Characteristics of included studies

Five studies were specifically aimed at women with postpartum depression; the remaining four targeted other groups (pregnant women; mothers of young children; mothers of children receiving psychiatric treatment; mothers of children with mental health problems). In six studies, participants had to meet diagnostic criteria for major depression or a mood disorder; in the other three studies, a cutoff score on a self-report measure was used as the inclusion criterion. In five studies, children were below the age of one, two studies were aimed at children older than age one, and one study was aimed at pregnant women and did not report specific outcomes in the children (only parenting/marital distress). Care-as-usual control groups were used in five studies; the other four studies used a waiting list control group. Four studies were conducted in the USA, three in the UK, and two in other countries (Australia, Taiwan) (Fig. 2).

In the nine studies, 11 psychotherapies were compared to a control group. Four of the therapies were cognitive behavioral (including one Internet based), three were interpersonal, and two used another type of therapy (counseling; psychodynamic therapy). In six therapies, an individual treatment format was used, four used a group format, and one used a guided self-help format. The number of therapy sessions ranged from 8 to 16.

The quality of the included studies varied. Four of the nine studies reported an adequate sequence generation. Two studies reported allocation to conditions by an independent

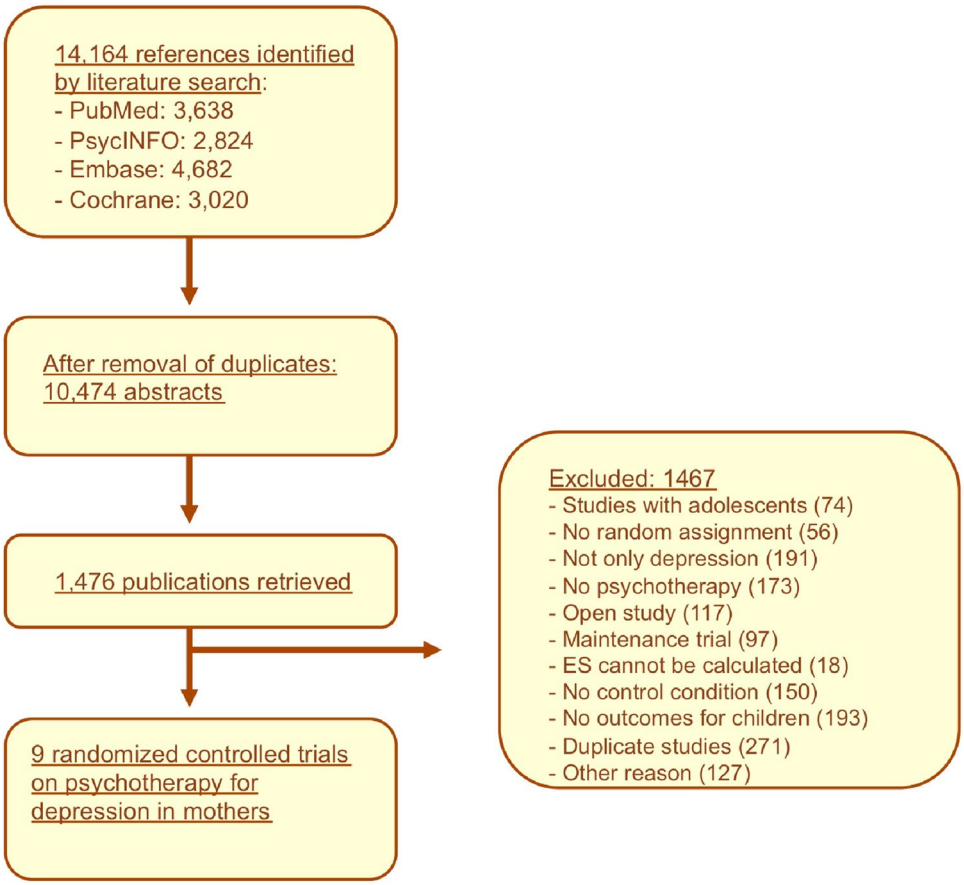

Fig. 1 Flowchart of inclusion of studies

(third) party. Eight studies reported blinding of outcome assessors, and in four studies intention-to-treat analyses were conducted. Three studies met all four quality criteria, two met two or three criteria, and the remaining four studies had a lower quality (none or one of the four criteria).

Outcomes in children

Five studies with seven comparisons between psychotherapy and a control group reported outcome on the mental health of the children whose depressed mothers received psychotherapy. The outcomes that were reported for each of these trials are presented in Table 2. The results are reported in Table 3. As can be seen in Table 2, the types of outcomes and the time at which they were measured differed considerably across studies. The pooled effect size of all studies and outcomes, indicating the difference between treatment and control conditions, was $g = 0.40$ (95 % CI 0.22–0.59; $p < 0.001$), which corresponds to an NNT of 4.50. Heterogeneity was low, but the confidence interval was broad ($I^2 = 1$; 95 % CI 0–71).

Although the number of studies was small, we conducted some basic subgroup analyses (Table 3) and found that the effect sizes in studies of women with postpartum depression did not differ significantly from studies of other mothers. In addition, no significant differences were found between high- and low-quality studies, between studies in which the intervention was aimed at mothers of children below versus above the age of one in the effect sizes associated with type of psychotherapy, or in group versus individual therapies.

We conducted a meta-regression analysis with the effect size for children's mental health as the dependent variable and the effect size of the study on depression in the mother as the predictor. No significant association was found between the effects of therapy on mothers' depression (see below) and on the mental health of their children ($p > 0.1$), but this may be due to the small number of included studies.

Inspection of the funnel plot did not indicate possible publication bias, nor did Duval and Tweedie's trim and fill procedure (the number of trimmed studies was zero, and the effect size adjusted for publication was exactly the same as the unadjusted effect size), or Egger's test ($p > 0.1$).

Because the number of studies was small and the differences between studies were considerable, we examined whether removal of one of the studies had a large impact on the overall effect size. That is, we conducted seven separate meta-analyses in which a different study was removed each time. Examples of differences among the studies were

Table 1 Selected characteristics of studies examining the effects of psychotherapy for depressed mothers on their children

References	Recruitment	Target group	Definition of depression	Children	Conditions	*N*	F	Nse	Qual[a]	Country
Cho [5]	Through obstetric clinics	Pregnant women	Mood disorder	Aimed at pregnant women; no direct outcomes in children	1. CBT	12	I	9	− − + −	Taiwan
					2. Care-as-usual	10				
Clark [6]	Referrals	Women with PPD	MDD	Children between 0 and 2 years of age	1. Supportive ther.	14	g	12	− − + −	US
					2. Waiting list	15				
Forman [15]	Community screening	Women with PPD	MDD	Children were 6 months old at the start of treatment	1. IPT	48	i	12	− − − +	US
Mulcahy [32]	Referrals from health professionals	Women with PPD	MDD	Children aged between 0 and 1 year	1. IPT	23	g	11	+ − + −	AU
					2. Care-as-usual	27				
Murray [33]	Screening of primiparous women	Women with PPD	MDD	Newly born children	1. Counseling	47	I	10	+ + + +	UK
					2. CBT	42	I	10		
					3. Psychodyn. ther	45	I	10		
					4. Care-as-usual	50				
					2. Waiting list	51				
Puckering [37]	Through routine screening	Women with PPD	EPDS > 10	Newly born children	1. CBT and support	10	g	14	− − + −	UK
					2. Waiting list	6				
Sheeber [39]	Invitation letters through Head Start	Mothers of young children	CES-D ≥ 21	Young children (mean age 4.7 years; SD = 0.7)	1. Internet CBT	35	sh	8	+ + + +	US
					2. Waiting list	35				
Swartz [41]	Pediatric mental health clinic	Depressed mothers of children receiving psychiatric treatment	MDD	School-age children between 6 and 18 years receiving psychiatric treatment	1. IPT	23	i	8	− − + +	US
					2. Care-as-usual	17				
Verduyn [42]	Community screening	Depressed mothers of children with mental health problems	BDI ≥ 15	Children between 2.5 and 4 years	1. CBT	30	g	16	+ + + −	UK
					2. Care-as-usual	13				

AU Australia, *BDI* Beck Depression Inventory, *CBT* cognitive behavior therapy, *CES-D* Center For Epidemiological Studies Depression Scale, *EPDS* Edinburgh Postnatal Depression Scale, *F* treatment format, *G* group format, *I* individual format, *IPT* interpersonal psychotherapy, *MDD* major depressive disorder, *Nse* number of sessions, *PPD* postpartum depression, *Psychodyn* psychodynamic, *sh* guided self-help, *UK* United Kingdom, *US* United States of America

[a] In this column, a positive or negative sign is given for four quality criteria, respectively: allocation sequence; concealment of allocation to conditions; blinding of assessors; and intention-to-treat analyses

Table 2 Measures used in studies on psychotherapy for depressed mothers to examine the outcomes on children's mental health, mother–child interactions, and parenting/marital distress

References	Children's mental health	Mother–child interactions	Parenting/marital distress
Cho [5]			Snyder's Marital Satisfaction Inventory-R
Clark [6]	Mental scale of Bayley (MDI)	Parent–infant interactions (PCERA; observational instrument)	Parenting Stress Index (PSI)
Forman [15]	Mother-reported emotion at 9 months (negative and positive)	Maternal responsiveness (Ainsworth's system)	Dyadic Adjustment Scale (DAS)
	Observed infant negative emotion at 9 months (negative and positive)		Parenting Stress Index (PSI)
Mulcahey [32]		Maternal Attachment Inventory (self-report; MAI)	Dyadic Adjustment Scale (DAS)
Murray [33]	Behavioral screening questionnaire at 18 months		
Puckering [37]		Observed mother–infant interactions	
Sheeber [39]		Mother aggression/low support (observation); Parent Behavior Inventory (PBI), hostile/coercive (HC) and supportive/engaged (SE)	Parenting Sense of Competence Scale
Swartz [41]	Child Behavior Checklist at 9 months		
	Children's Depressive Inventory at 9 months		
	Columbia Impairment Scale		
Verduyn [43]	Child Behavior Checklist		
	Eyberg Child Behavior Inventory		

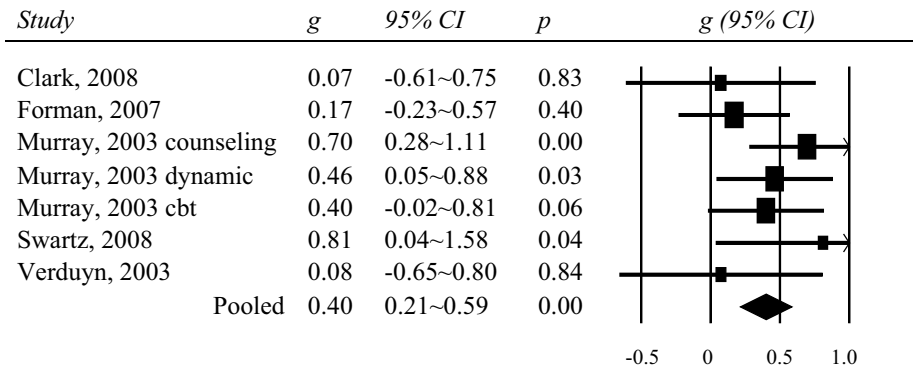

Fig. 2 Effects of psychological treatment of psychotherapy for depressed mothers on their children: Hedges' *g*

that in the study by Swartz et al. [38], the children were also treated (which was not the case in other studies), and the study by Murray and colleagues [30] was the only study in which counseling was used as the psychological intervention with mothers. We conducted seven separate meta-analyses in which a different study was removed each time. The biggest impact was the removal of the study by Murray et al. [33] (the counseling condition); the remaining studies resulted in an effect size of $g = 0.33$ (95 % CI 0.12–0.53), which was still significant at the $p < 0.001$ level. In the positive direction, removal of the study by O'Hara et al. [34] had the highest impact ($g = 0.46$; 95 % CI 0.26–0.67; $p < 0.001$).

Mother–child relationships and parenting/marital distress

The mother–child relationship was examined in four studies. The pooled effect size was $g = 0.40$ (95 % CI 0.12–0.68; NNT = 4.50), with zero heterogeneity ($I^2 = 0$; 95 % CI 0.85). The effects of psychotherapy on parenting/marital distress was also examined in four studies, and the resulting effect size was $g = 0.77$ (95 % CI 0.27–1.28; NNT = 2.42; $I^2 = 62$; 95 % CI 0–87). We also looked separately at marital distress (according to the DAS and Snyder's Marital Satisfaction Inventory) and parenting stress (PSI), but the number of studies was too small to allow us to draw any conclusions from that.

Table 3 Effects of psychological treatment of psychotherapy for depressed mothers on their children: Hedges' *g*

	N	*g*	95 % CI	I^2	95 % CI	p^a	NNT
Effects on mental health of children							
All studies	7	0.40	0.22–0.59	1	0–71		4.50
Subgroup analyses							
Target group							
PPD	5	0.39	0.17–0.60	5	0–80	0.92	4.59
Other mothers	2	0.42	−0.13–0.98	46	[b]		4.27
Quality score							
0–2	3	0.26	−0.06–0.57	18	0–91	0.27	6.85
3–4	4	0.48	0.25–0.70	0	0–85		3.76
Therapy type							
CBT	2	0.31	−0.12–0.73	0	[b]	0.76	5.75
IPT	2	0.34	−0.08–0.75	52	[b]		5.26
Other	3	0.49	0.17–0.80	17	0–91		3.68
Children's age							
Below 1 year	5	0.39	0.17–0.62	5	0–80		4.59
1 year and older	2	0.42	−0.13–0.98	46	[b]		4.27
Format							
Individual	5	0.45	0.25–0.65	4	0–80	0.17	4.00
Group	2	0.07	−0.42–0.57	0	[b]		25.00
Effects on depression							
All studies	11	0.66	0.46–0.87	35	0–68		2.78
One effect size per study (highest)	9	0.78	0.57–0.99	13	0–54		2.39
One effect size per study (lowest)	9	0.73	0.47–0.99	42	0–73		2.54
Effects on mother–child interactions							
All studies	8	0.35	0.17–0.52	0	0–68		5.10
Effects on parenting/marital distress							
All studies	5	0.67	0.30–1.04	51	0–82		2.75
Only marital distress (DAS; Snyder's Inv.)	3	0.85	0.31–1.40	68	0–91		2.21
Only parenting stress (PSI	2	0.40	−0.23–1.04	18	[b]		4.50

According to the random effects model

CBT cognitive behavioral therapy, *CI* confidence interval, *IPT* interpersonal psychotherapy, *NNT* number-needed-to-treat, *PPD* postpartum depression

[a] The *p* value indicates whether the subgroups differ from each other

[b] The 95 % CI of I^2 cannot be calculated when the number of studies is 2 or smaller

Effects on depression

The effects of psychotherapy on depression in the mothers could be examined in ten comparisons (in one study, three types of psychotherapy were compared with a control group) [33]. The pooled effect size was $g = 0.64$ (95 % CI 0.42–0.87; $p < 0.001$) with low to moderate heterogeneity ($I^2 = 39$; 95 % CI 0–71). This effect size corresponds to an NNT of 2.86 (Table 3).

The one study with three effect sizes [33] may have artificially reduced heterogeneity and impacted the pooled effect size. Therefore, we conducted another analysis in which only one effect size from this study was included (the largest), and another meta-analysis in which we included only the smallest effect size. As can be seen from Table 3, the removal of these effect sizes did not have a major impact on the overall effect sizes or heterogeneity.

There were some indications of publication bias. Duval and Tweedie's trim and fill procedure resulted in an adjusted effect size of $g = 0.43$ (95 % CI 0.17–0.69; number of trimmed studies = 4), although Egger's test of the funnel plot was not significant ($p > 0.10$).

Discussion

This meta-analysis examined whether psychological treatment of depression in mothers had a significant effect on their offspring. We did indeed find that these treatments had a small to moderate effect on their children. This is an encouraging finding from a clinical perspective, because it suggests that treatment of depression affects not only the mothers themselves, but also the mental health outcomes of their children. In addition, these treatments were found to have a small to moderate impact on parenting/marital

distress and on the patterns of interactions between mothers and their children.

The measures of children's outcomes, the mother–child relationships, and parenting/marital distress, however, differed considerably across studies in both how these constructs were operationalized and when they were measured. Furthermore, the quality of most of the studies was not optimal, with only two studies meeting all quality criteria. Therefore, the results of this meta-analysis have to be considered with caution. More high-quality research is needed before a definite conclusion can be drawn about the effects of psychotherapy for depressed mothers on their children.

In the meta-analysis, we also found a moderate size effect of psychotherapy on the depression in the mothers. This finding is very much in line with our previous meta-analysis on psychological treatments for depression [10] and on a specific meta-analysis on the treatment of postpartum depression [11].

From a clinical perspective, the current findings are promising. As noted earlier, having a mother with depression is a strong predictor of subsequent development of psychopathology in her children [14]. If psychological treatment of mothers can attenuate this risk, it should be considered as a preventive intervention that can save both distress in children and costs to society. Although a few studies included measures of the mother–child relationship and parenting/marital distress, more studies are needed given that early attachment and interaction patterns can be affected by depression in mothers. This is important, because earlier research has shown that preventive interventions aimed at young children are effective in changing insensitive parenting and infant attachment insecurity [1], and that improvement of parent–child relationships has a positive effect on children. It is very possible that successful treatment of depression allows mothers to improve their parenting behaviors, which then enhances the quality of their relationship with their children and thereby results in more positive child outcomes.

It is not clear from this review whether the effects of treatment are specific to depression or if similar results would be obtained when mothers have comorbid or other conditions such as anxiety disorders. Second, whereas much more is known about the effects of mothers' depression on children's development, the role of fathers' psychopathology and its treatment also should be explored [8, 26].

Another important issue concerns the effect of pharmacotherapy alone, psychotherapy alone, or the combination of pharmacotherapy and psychotherapy on mothers' depression and children's outcomes. Given that medication is widely prescribed, future studies need to explore the effects of different types of treatments for parental depression on their children's outcomes. It is unclear whether the type of treatment for depression that the parent receives matters as much as that their depression remits.

This study has several important limitations. The number of studies was small, the age range of the children studied was limited, the quality of the studies that were conducted was not optimal, and the measures of the outcomes used differed considerably across studies. The results of this meta-analysis therefore should be considered preliminary.

Future research needs to not only examine whether improvements in parents' depression impact children's psychopathology and functioning, but should also identify the mechanisms underlying the intergenerational transmission of depression [19]. Maternal depression has been shown to launch a set of risk factors (e.g., stressful life events, family dysfunction, and low self-worth in children), which in turn have been found to predict the growth of depressive symptoms during adolescence [19]. Does reducing parents' depression directly decrease family stress or improve parenting behaviors? For example, increasing observed positive parenting behaviors of depressed parents during parent–child interactions has been found to reduce the rates of depression and other psychopathology in their children [7]. Whether or not these parenting changes were the direct result of decreases in parents' depression needs to be studied further in a randomized controlled trial. Finally, are there reciprocal effects such that improvements in children's symptoms and functioning positively impact parents' psychopathology as well as the reverse? Kouros and Garber's [27] clarification of these mechanisms will allow us to develop and implement more effective interventions for preventing the adverse effects of parental depression on children.

Conflict of interest None.

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